

C4220 Log Data Report

Borehole Information:

Borehole: C4220		Site: 216-U-8 Crib			
Coordinates (WA State Plane)		GWL (ft)¹: Dry	GWL Date: 01/27/2004		
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
Not Available	Not Available	Jan. 2004	Not Available	50	Push Hole

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded steel	0.3	6 5/8	5 5/8	1/2	0.3	48.5

Borehole Notes:

The logging engineer measured a sample of casing located in a lay-down area next to the borehole. Casing diameter was measured using a caliper and a steel tape, and measurements were rounded to the nearest 1/16 in.

Logging Equipment Information:

Logging System: Gamma 1E	Type: SGLS (70%) 34TP40587A
Calibration Date: 01/2004	Calibration Reference: GJO-2004-568-TAC
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2 / Repeat	3		
Date	01/27/04	01/27/04			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	48.5	33.5			
Finish Depth (ft)	0.5	27.5			
Count Time (sec)	100	100			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	1.0	1.0			
ft/min	N/A ³	N/A			
Pre-Verification	AE071CAB	AE071CAB			
Start File	AE074000	AE074049			
Finish File	AE074048	AE074055			
Post-Verification	AE074CAA	AE074CAA			
Depth Return Error (in.)	0	0			

Log Run	1	2 / Repeat	3		
Comments	No fine-gain adjustment.	No fine-gain adjustment.			

Logging Operation Notes:

Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 118. Logging started at the nearest 0.5-ft interval after reaching total depth. The maximum logging depth is 48.5 ft. Zero reference is the ground surface.

Analysis Notes:

Analyst:	Henwood	Date:	02/04/04	Reference:	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day. All of the verification spectra were within the acceptance criteria. Examinations of spectra indicate that the detector functioned normally during logging, and the spectra are accepted.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1EJan04.xls). Zero reference was the ground surface. Based on the field measurements, the casing configuration was assumed as one string of 6-in. casing with a thickness of 1/2 in. to 48.5 ft (total logging depth). The dead time correction is applied when the dead time exceeds 10 percent. A water correction was not required.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs and ^{238}U were the man-made radionuclides detected in this borehole. ^{137}Cs was detected in the interval between 33.5 and 48.5 ft with concentrations ranging from 0.3 to 534 pCi/g. The maximum concentration was measured at 34.5 ft.

^{238}U as inferred from the $^{234\text{m}}\text{Pa}$ 1001-keV energy peak was detected at 34.5 and 35.5 ft. The maximum concentration was 157 pCi/g at 34.5 ft. ^{235}U , which is measured directly by the 186-keV energy peak, is usually detected where the $^{234\text{m}}\text{Pa}$ energy peak is detected at a ratio of approximately 1:20. The MDL for ^{235}U in this high ^{137}Cs interval is approximately 14 pCi/g. Thus, ^{235}U probably exists with the ^{238}U at a concentration below 14 pCi/g.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural radionuclides at energy levels of 1461, 1764, and 2614 keV.

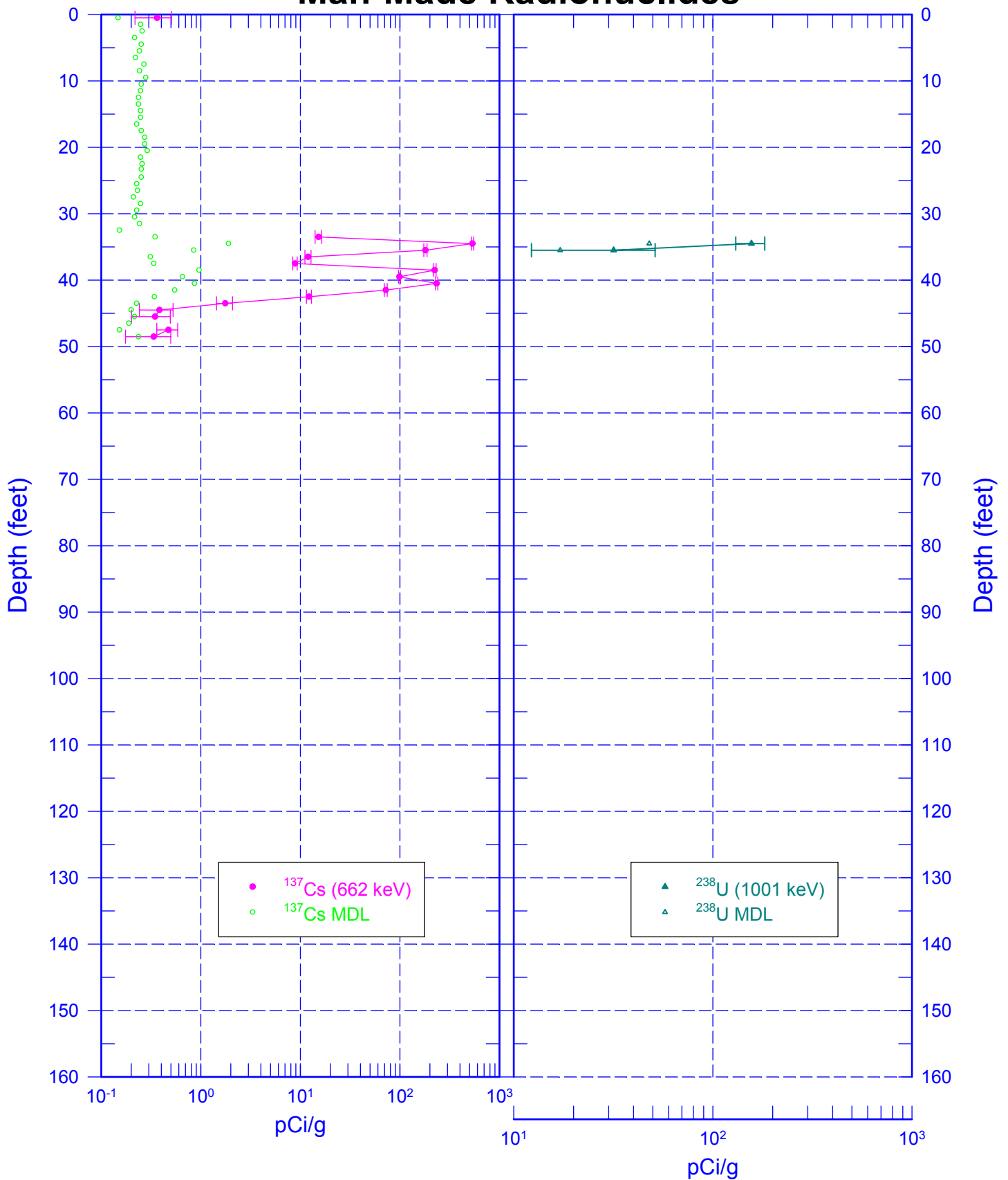
¹ GWL – groundwater level

² TOC – top of casing

³ N/A – not applicable

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Man-Made Radionuclides



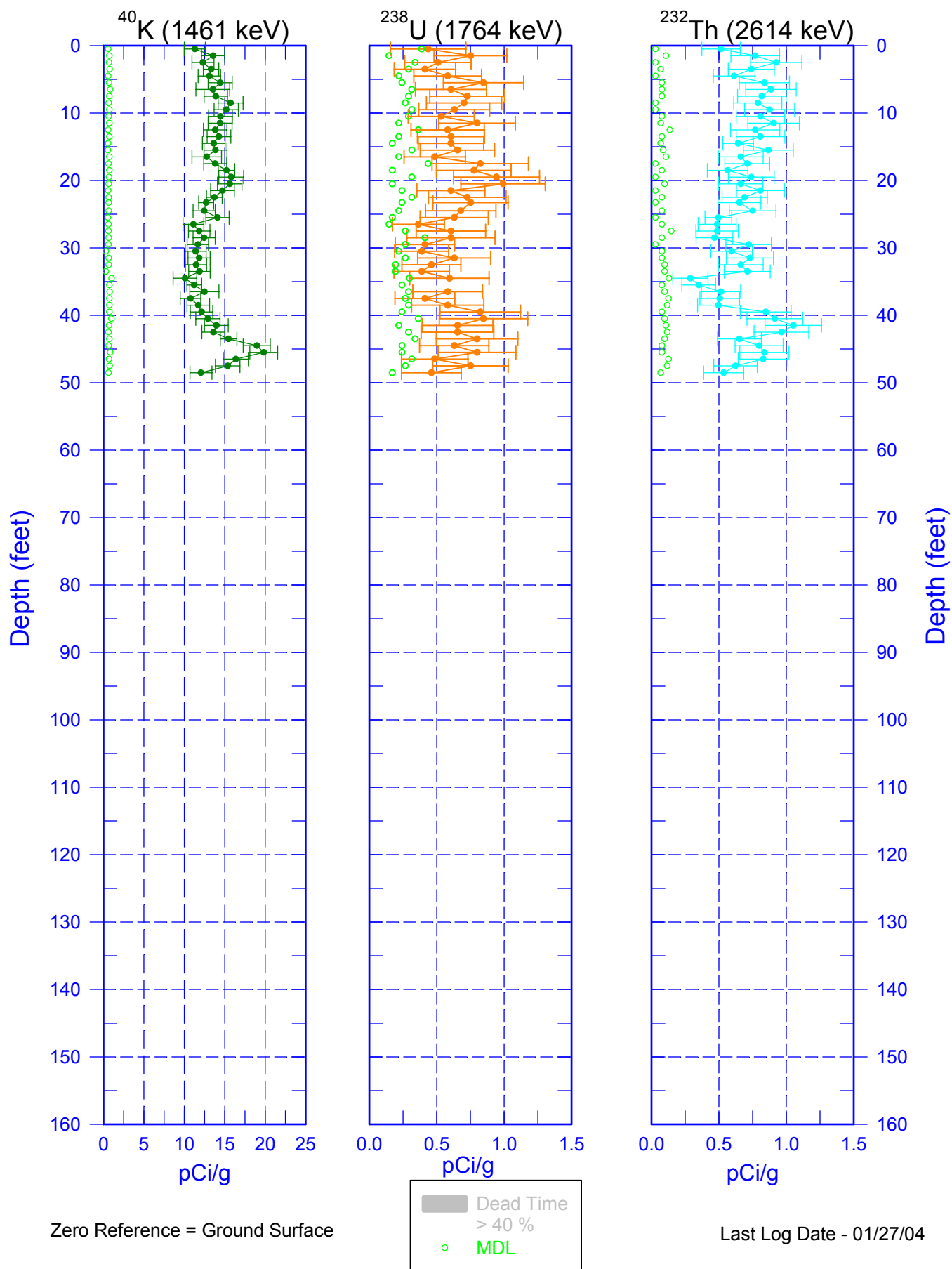
Zero Reference = Ground Surface

Depth Scale: 1"=20 ft

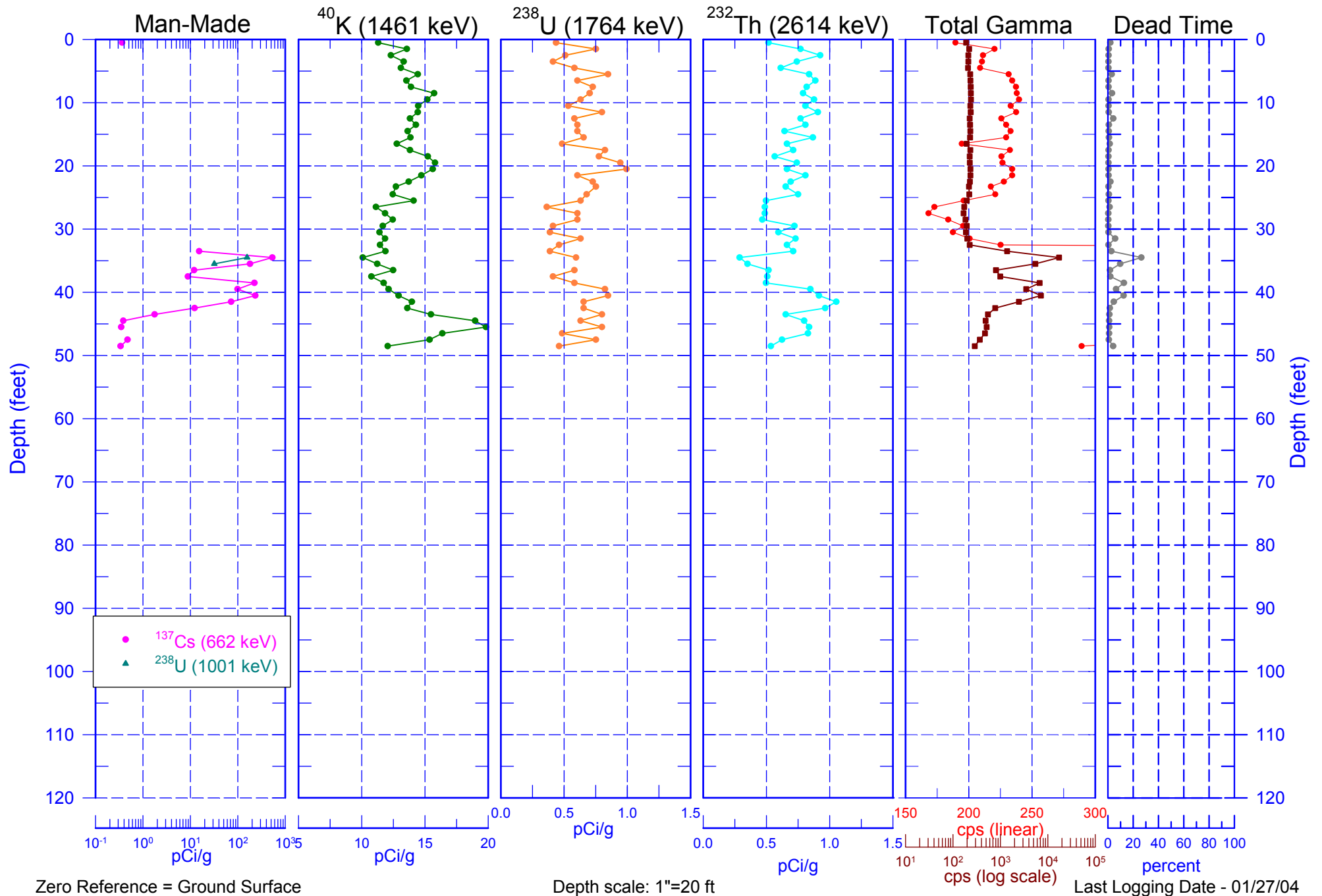
Last Log Date - 01/27/04

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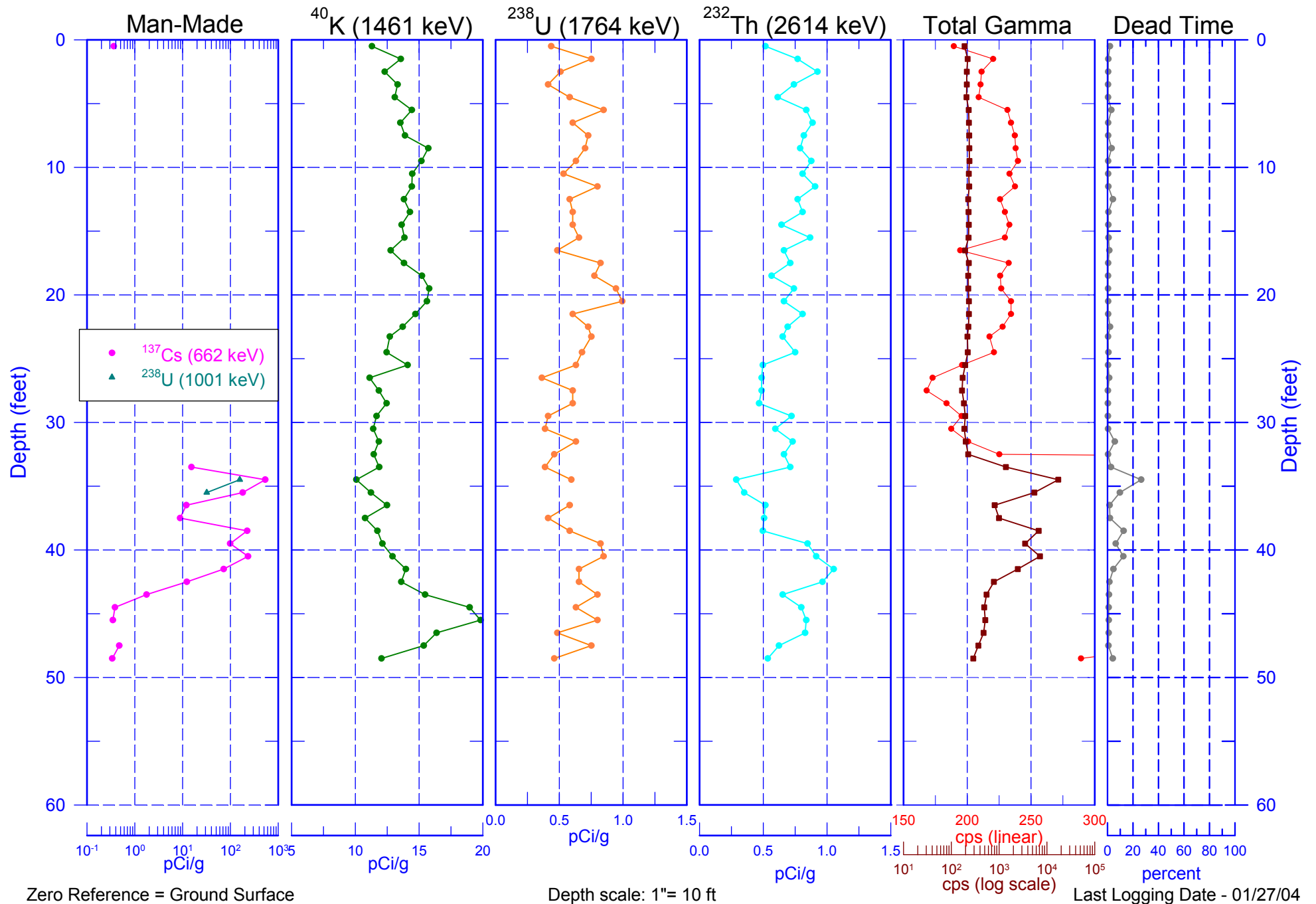
Natural Gamma Logs



C4220 Combination Plot

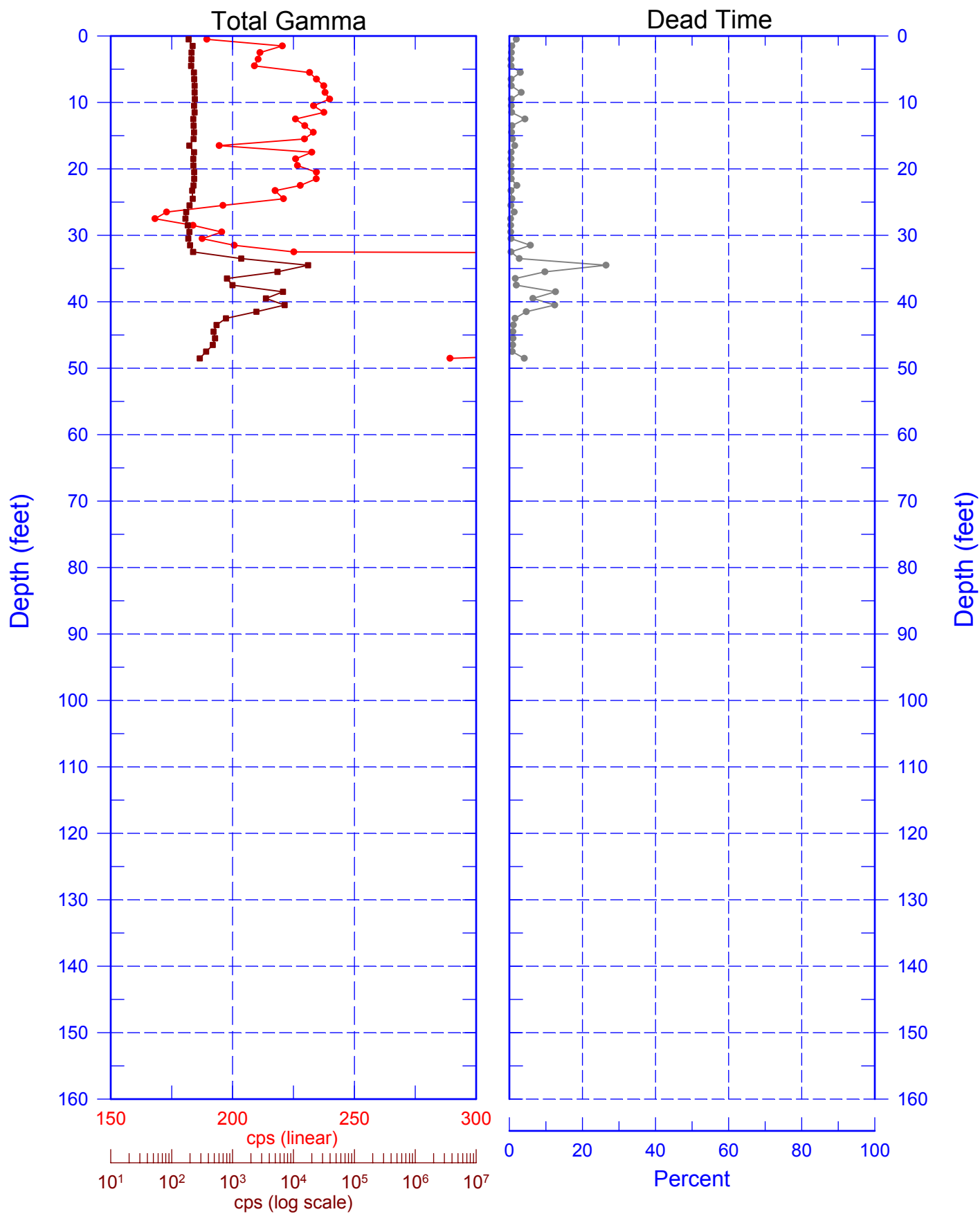


C4220 Combination Plot



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Total Gamma & Dead Time



Depth scale: 1"=20 ft

Reference - Ground Surface

Last Log Date - 01/27/04

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Repeat Section of Natural Gamma Logs

